DOCUMENT RESUME

ED 262 180 CE 042 545

TITLE	A Project to Review the Vocational Cluster System. Summary of Findings and Recommendations.
INSTITUTION	Oregon Occupational Information Coordinating Committee, Salem.
SPONS AGENCY	Oregon State Dept. of Education, Salem. Div. of Vocational Education.
PUB DATE	24 Jul 85
NOTE	76p.; For a related document, see CE 042 544.
PUB TYPE	Reports - Evaluative/Feasibility (142)
EDRS PRICE	MF01/PC04 Plus Postage.
DESCRIPTORS	Competence; *Curriculum Development; Demand Occupations; Educational Needs; Employment Opportunities; *Employment Projections; Futures (of Society); *Job Skills; Job Training; *Labor Needs; *Occupational Clusters; Occupational Surveys; Program Improvement; Secondary Education; State Curriculum Guides; Statewide Planning; *Vocational Education
IDENTIFIERS	*Oregon

ABSTRACT

A review was conducted of the clusters used to organize the delivery of secondary vocational education in Oregon. The review focused on issues related to Oregon's current and projected labor market needs, national occupational and industrial trends, and the common skills and competencies that form the basis for organizing occupations and training programs into clusters. This report includes the following information: (1) a description of the activities undertaken in the review process; (2) a description of the Oregon occupational and industry outlook into the 1990s; (3) a new configuration of clusters that includes a description, key industries of employment, types of work performed, work aptitudes and interests, programs of training, and key occupations; (4) a list of major considerations in reviewing the existing clusters; (5) recommendations for the implementation of a revised cluster approach; (6) recommendations for ongoing review and assessment of clusters; and (7) a bibliography of resources used by staff during the cluster review project. (KC)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED262180

A PROJECT TO REVIEW THE VOCATIONAL CLUSTER SYSTEM

SUMMARY OF FINDINGS AND RECOMMENDATIONS

Submitted by: Occupational Program Planning System
Oregon Occupational Information
Coordinating Committee
875 Union Street NE
Salem, OR 97311

Submitted to: Oregon Department of Education
Division of Vocational Education
700 Pringle Parkway SE
Salem, OR 97310

U.S. DEPARTMENT OF EDUCATION
NATIONAL INSTITUTE OF EDUCATION
EDUCATIONAL RESOURCES INFORMATION
CENTER (ERIC)

This document has been reproduced as received from the person or organization originating it

Minor changes have been made to improve reproduction quality

Points of view or opinions stated in this document do not necessarily represent official NIE position or policy

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

S J Case

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

CE042545

Date: July 24, 1985

INTRODUCTION

In May 1984, the Oregon Occupational Information Coordinating Committee (OOICC) and the Occupational Program Planning System (OPPS), operated by the Oregon Employment Division, submitted a proposal to the Department of Education to conduct a review of the clusters used to organize the delivery of secondary vocational education in the State. The proposal stated that the review would focus on issues related to Oregon's current and projected labor market needs, national occupational and industrial trends and the common skills and competencies which form the basis for organizing occupations and training programs into clusters.

This report includes the following information:

(1) Describes the activities undertaken in the review process
(2) Describes the Oregon occupational and industry outlook into the 1990's
(3) Presents a new configuration of clusters which includes a description; key industries of employment, types of work performed; worker aptitudes and interests, programs of training; and key occupations.
(4) Lists major considerations in revising the existing clusters
(5) Makes recommendations for the implementation of a revised cluster approach
(6) Makes recommendations for ongoing review and assessment of clusters
(7) Provides a bibliography of resources used by staff during the cluster review project.

STATEMENT OF THE PROBLEM

Oregon's cluster approach to the delivery of vocational education at the secondary school level was developed in the late 1960's. Occupations related on the basis of common skill and industry competencies were grouped to form clusters encompassing an entire career ladder. Labor

market information was a critical factor in the identification of these clusters. Criteria were established which required an employment level of at least 10,000 and projected expansion/replacement needs (openings) of 400 per year for an occupational area to qualify as a bona fide cluster.

The Oregon economy, the role of secondary vocational education and the delivery of vocational instruction changed significantly over the past 15 years. During that time, there was no systematic review of the cluster concept and the occupational and industrial trends supporting it. Technological change impacted not only the kinds of occupations for which vocational education at the high school level prepared students, but the tasks done by workers in many occupations and industries.

OOICC and OPPS therefore conducted a comprehensive review of the cluster system, focusing primarily on the relevance of existing clusters to projected state and national labor market conditions and trends. Criteria for matching current and new clusters to Oregon's labor market were established, including the following:

1. Clusters should be based upon common and transferable skills needed by industry.
2. Clusters should reflect Oregon's changing economy and industrial profile.
3. Clusters should reflect industry and occupational career ladders.
4. Clusters should relate to career exploration classifications as well as share common occupational characteristics such as aptitudes, interests and work fields.
5. Clusters should relate to a variety of occupational and educational classification systems.

6. Clusters should consist of a number of identifiable specific programs of training.

In applying these criteria, the two organizing principles were that occupations should be clustered around either Oregon's industry composition or functional relationships to the place of work.

CLUSTER REVIEW METHODOLOGY

The first step in the Cluster Review was to conduct a national literature search for research on the role and delivery of secondary vocational education, for clustering approaches used by other states and for national classification and information systems which could provide a foundation for relating occupations to instruction in a valid and reliable manner. This literature review strongly supported the delivery of broadly-based vocational education programs at the secondary school level that would provide students with basic skills and knowledge required for entry level employment, impart appropriate work habits and attitudes and form the basis for further on-the-job and/or classroom training. The literature did not support the delivery of highly specific skill training for secondary school students.

Occupational demand/supply reports from many other states were examined to determine ways in which occupations were related to training programs. Two-tiered systems were the most commonly used, following the Vocational Preparation and Occupations crosswalk developed by the National Occupational Information Coordinating Committee.

Staff thoroughly studied the Guide for Occupational Exploration and the

Occupational Aptitude Pattern manual, the Oregon Career Information System's clustering approach, technical supplements to the Dictionary of Occupational Titles and the new Occupational Employment Statistics classification based on the Standard Occupational Classification system to devise a systematic approach to cluster identification and organization. Oregon occupations were computer sorted by many of these variables to study the internal consistency of the present clusters and to discern potential new organizational approaches.

As a result of this research, a proposed new cluster configuration was developed. The next step in the project was to convene an advisory committee of high school and community college vocational educators, Regional Coordinators for Career and Vocational Education, and representatives of general school administrators, apprenticeship and Job Training Partnership Act programs to review the proposed new clusters. (A list of advisory committee members is included in the Appendix.)

The advisory committee held a work session on April 30 in Salem to critique the proposed cluster criteria and configuration. Following that meeting, staff revised the clusters on the basis of the advisory committee input. An information session was then held with members of the Division of Vocational Education Administrative Staff. The response from those present was very positive, and the consensus was that the cluster revisions were "on the right track." A second meeting of the advisory committee was held on May 29, at which time they approved the revised clusters with some minor changes suggested. Follow-up telephone contacts were made with those advisory committee members who were unable to attend the second meeting to obtain their input.

Final project activities included the development of detailed worksheets for each cluster, preparation of this Summary of Findings and Recommendations and the Final Report and scheduling follow-up with the Division of Vocational Education.

OREGON OCCUPATIONAL AND INDUSTRY PROJECTIONS

The economic recession of the early 1980's in Oregon was long and deep; almost 100,000 jobs were lost. The post recession in Oregon is characterized by low inflation, high interest rates, slow population growth, a strong dollar and increased competition in lumber and wood products. Changes in the cluster system must reflect restructuring in the economy and the projected occupational and industrial trends to the mid-1990's.

Oregon's economic transition can be seen by looking at the occupational "losers" and "winners" of the recession. The "losers" fall into three major groups. First, there are those occupations affected by the decline in lumber and wood products. These include Chain Offbearers, Cut-off Saw Operators, Fallers and Buckers, and Veneer Graders. A second group of "losers" is related to the downturn in construction activity. These include Bricklayers, Carpenters, Cement Masons, Electricians, Plumbers and Pipefitters, Welders and Flamecutters.

The employment decline in the third group of occupations is not as simple to explain. A combination of automation and changing demand reduced employment for Hand Bookkeepers, Bookkeeping and Billing Machine

Operators, Drafters, Machine Tool Operators, Machinists, Automotive Mechanics and Typists. The demand for these occupations has not only been affected by the use of computers, but the job duties have also been transformed. It appears that as Typists become Word Processing Operators and Drafters become Computer Assisted Designers, industry does not need as many workers.

Gains in productivity may allow for the reduction of personnel, but reduced employment is not necessarily an outcome of automation and computer applications. Shifts in demand have occurred, however, and the skills needed by workers continue to change.

Most of the occupational "winners" are related to the service and trade industries. These occupations include Bartenders, Counter Attendants, Fast Food Workers and Restaurant Managers. In fact, "Eating and Drinking Places" have created more jobs since 1974 than any other industry. Another group of occupational "winners" is the result of changing social conditions and attitudes. The dual income family has increased the need for child care, as well as the desire to eat out more often. The growing emphasis on better physical health has increased the need for such occupations as Weight Reducing Instructors and Recreation Therapists.

Current projections made by the Employment Division's Research and Statistics Section indicate that the greatest number of new jobs will occur in traditional occupations. "High tech" and exotic new occupations will comprise only a very small portion of the labor market in 1986. Table I presents a ranked list of the 15 occupations projected to have the largest number of openings due to growth and replacement in 1986.

Table I

Occupation	Projected 1986 Openings	Projected 1986 Employment
Sales Representative	2,835	44,533
Janitors, Porters & Cleaners	1,696	19,977
Secretary	1,588	27,643
Sales Clerks	1,258	19,419
General Clerk	1,240	22,110
Waiter or Waitress	1,081	20,034
Nurse Aide/Orderly	972	12,765
Hand Bookkeeper	955	14,044
Cashier	903	17,321
Professional Nurse	814	15,908
Fast Food Prep. & Service Worker	793	13,574
Store Manager	768	11,424
Kitchen Helper	767	12,687
Truck Driver	745	19,510
Cleaner, Housekeeping	732	7,918

The latest industry employment projections developed by the Research and Statistics Section also indicate strong growth in trade and services. Table II lists those industries projected to create the largest number of new jobs between 1983 and 1991. It is interesting to note that "high tech" industries (Measuring and Controlling Instruments, Electronic Components and Accessories, Office Computing and Accounting Machines and Telephone Communication) will create almost exactly the same number of new jobs as will "high calorie" industries (Eating and Drinking Places and Grocery Stores).

The projected growth in "high tech" industries should be continually studied. Although many firms recently announced plans to locate in Oregon, several subsequently decided to postpone construction or expansion. The current downturn that many electronics firms are

experiencing is indicative of cyclical industry trends. Vocational planners must consider both short and long term conditions and projections when reviewing labor market needs.

Table II

Industry Title	1983 Employment	Projected 1991 Employment	Jobs to Be Created 1983-1991
Eating & Drinking Places	65,351	76,000	10,649
Nursing & Personal Care Facilities	12,877	19,804	6,927
Measuring & Controlling Instruments	12,350	17,200	4,850
Grocery Stores	24,312	28,497	4,185
Offices of Physicians	11,310	15,266	3,956
Electronics Components & Accessories	6,475	10,000	3,525
Hotels, Motels & Tourist Camps	12,752	16,000	3,248
Misc. Shopping Goods Stores	8,069	11,251	3,182
Elementary & Secondary Schools	59,840	63,000	3,160
Office Computing & Accounting Machines	6,257	9,400	3,143
Telephone Communication	10,671	13,693	3,022
Department Stores	22,073	25,049	2,976
Machinery Equipment & Supplies	15,471	18,000	2,529
Religious Organizations	9,396	11,907	2,511
General Bldg. Contractors (Resid.)	3,585	5,972	2,387

Four industries are projected to lose at least 1,000 jobs between 1983 and 1991. They include Sawmills and Planing Mills (-1,416), Local Government (-1,635), Millwork, Veneer and Plywood (-1,788) and Agricultural Production (-2,886).

Projected industry growth rates provide a different perspective on demand. Using arbitrary criteria of 2,000 employed in 1983, 1,500 jobs to be created between 1983 and 1991 and a growth rate of at least 25%, Table III lists those industries whose growth could have the most significant impact on the Oregon economy between 1983 and 1991.

Table III

Industry Title	1983 Employment	Projected 1991 Employment	Growth Rate 1983-1991
Cutlery, Hand Tools & Hardware	2,036	4,200	106.29%
Masonry, Stonework, Tile & Plaster	2,124	4,083	92.23
Heavy Construction, except Highway	2,641	4,773	80.73
General Bldg. Contractors (Non-Resid.)	2,946	4,992	69.45
General Bldg. Contractors (Resid.)	3,585	5,972	66.58
Motor Vehicles & Equipment	3,319	5,500	65.71
Individual & Family Social Services	2,972	4,653	56.56
Child Day Care Services	2,778	4,321	55.54
Electronic Components & Accessories	6,475	10,000	54.44
Nursing & Personal Care Facilities	12,877	19,804	53.79
Plumbing, Heating & Air Conditioning	3,477	5,310	52.72
Electrical Work	2,776	4,234	52.52
Office Computing & Accounting Machines	6,257	9,400	50.23
Misc. Amusement & Recreation Services	4,914	7,286	48.27
Computer & Data Processing Services	2,892	4,239	46.58

It is important to note the assumptions underlying these growth rate projections. For example, one might assume that a significant demand for construction workers will exist with high growth rates projected in six construction related industries. However, these growth rates to a large extent represent "catching up" to pre-recession employment levels and assume that conditions favorable to expansion of residential and commercial construction will exist. In addition, there is a large pool of experienced unemployed construction workers available to take the "new" jobs. Major program development in construction related fields is therefore not warranted solely by the high projected industry growth rates.

PROPOSED CLUSTER CONFIGURATION

Proposed reconfigurations of the clusters are described on the following pages. The first section gives an overview of the clusters, their related training programs and key occupations associated with each. References to the Career Information System's clusters are also shown. The second section provides a detailed description of each cluster, including the projected 1985 employment and openings, 1984 unemployed, key Oregon industries which employ workers in each cluster, types of work performed, worker aptitudes and interests, programs of training and key occupations.

State of Oregon
EMPLOYMENT DIVISION
Department of Human Resources

Occupational Program Planning System
July 19, 1985

PROPOSED NEW CLUSTERS

CLUSTER Program of Training Key Occupation	1985 Employment	1985 Openings	SIC Code	Key Industries	Key CIS Clusters
1. **NATURAL RESOURCES MANAGEMENT**	54,364	2,435	01	Agricultural Production--Crops	Agri. & Forestry
Agricultural Business & Mgmt.			02	Agricultural Production--Livestock	Timber Products
County Agr. Ext. Agent			07	Agricultural Services	Mining
Agricultural Production			08	Forestry	
Farm Equipment Operator			09	Fishing, Hunting, & Trapping	
Animal Production			12	Bituminous Coal & Lignite Mining	
Livestock Breeder			14	Nonmetallic Minerals, except Fuels	
Agri. Products & Processing			24	Lumber & Wood Products	
Food Miller			91	Local Government	
Horticulture, General			99	Federal Government	
Gardener & Groundskeeper					
Slaughtering & Butchering					
Poultry Dresser					
Farm Workers					
Livestock Handler					
Conventional Energy Sources					
Substation Operator					
Papergoods Mach. Operator					
Slitter Machine Oper.					
Planing Mill Operations					
Sander, Wood					
Wood Turning Operations					
Wood Working Mach. Oper.					
Woodworking, Other					
Lumber Grader					
Sawmilling					
Cut-off Saw Operator					
Veneer & Plywood					
Core Layer					
Logging					
Faller/Bucker					
Pulp & Paper					
Back Tender					

CLUSTER Program of Training Key Occupation	1985 Employment	1985 Openings	SIC Code	Key Industries	Key CIS Clusters
1. **NATURAL RESOURCES MANAGEMENT** (Cont.)					
Forest Products, Other Hook & Chainer					
Forestry & Related Science Forest Conservation Worker					
Sanitation Technology Sewage Plant Operator					
Heavy Equipment Operation Yarder Engineer					
Commercial Fishing Deckhand, Fishing Vessel					
2. **CONSTRUCTION**	36,186	2,545	15	General Building Contractors	Construction
			16	Heavy Construction Contractors	
			17	Special Trade Contractors	
Civil Technology Civil Engineer					
Tile & Masonry Brick Layer					
Carpentry Carpenter					
Construction Inspection Construction Inspector					
Glazing Glazier					
Painting & Decorating Painter Maintenance					
Plastering Plasterer					
Roofing Roofer					
Construction Trades, Other Cement Mason					
Plumbing & Pipefitting Plumber/Pipefitter					
Millwork & Cabinet Maker Cabinet Maker					
Construction Equip. Operation Heavy Equip. Operator					
Electrician Electrician					

CLUSTER Program of Training Key Occupation	1985 Employment	1985 Open-ings	SIC Code	Key Industries	Key CIS Clusters
3. **METALS** Industrial Technology Industrial Engineer Metallurgical Technology Metallurgist/Metal Engr. Watch Repair Watch Maker Automotive Body Repair Body Repairer, Automotive Foundry Furnace Operator Machine Shop/Tool Operation Machinist Sheet Metal Sheet Metal Worker Welding/Brazing/ & Soldering Welders & Flamecutters Precision Metal Work, Other Tool & Die Maker Jewelry Design & Repair Jeweler/Silversmith Plastics Compression/Injection Mold	27,853	1,932	30 33 34 35	Plastics Primary Metal Industries Fabricated Metal Products Machinery, except Electrical	Metalworking
4. **TRANSPORTATION & TRADE** Truck/Bus/Taxi Driving Truck Driver Deckhands & Sailors Able Seaman Rail Transportation Braker Airplane Pilot/Navigation Airplane Pilot	26,118	1,172	40 41 42 44	Rail Road Transportation Local & Inter-urban Passenger Transit Trucking & Warehousing Water Transportation	Transportation

CLUSTER Program of Training Key Occupation	1985 Employment	1985 Openings	SIC Code	Key Industries	Key CIS Clusters
5. **MARKETING** Marketing Mgmt. & Research Market Research Analyst Real Estate, General Sales Agent, Real Estate Financial Services Marketing New Account Teller Sales Sales Representative Insurance Marketing, General Sales Agent, Insurance Advertising Public Relations Practice Auto. Vehicle/Access. Mktg. Manager, Parts Dept.	150,848	9,020	50 51 53 54 65	Wholesale Trade--Durable Goods Wholesale Trade--Nondurable Goods General Merchandise Stores Food Stores Real Estate	Stock Control Sales
6. **BUSINESS MANAGEMENT (SUPPORT)** Accounting Accounts & Auditors Bookkeeping Bookkeeper, Hand Machine Billing/Bookkeeping Bookkeeping & Billing Data Programming Computer Programmer Systems Analysis System Analyst Personnel & Training Prog. Personnel & Labor Relation Shipping/Receiving Stock Clerk Stock Clerk Storeroom Purchasing Agents & Buyers Not Applicable	63,916	3,776	60 73 86 893 93	Banking Business Services Membership Organizations Accounting, Auditing & Bookkeeping Finance, Taxation & Monetary Policy	Administrative Bookkeeping/Acct. Math & Computing

CLUSTER Program of Training Key Occupation	1985 Employment	1985 Open- ings	SIC Code	Key Industries	Key CIS Clusters
7. **HOSPITALITY & RECREATION**	143,804	9,354	70	Hotels & Other Lodging Places	Bldg. Maintenance
			47	Transportation Services	Food Service
			58	Eating & Drinking Places	
			79	Amusement & Recreation Services	
			82	Educational Services	
Food Products					
Cheese Maker					
Waiter/Waitress/Related Service					
Waiter/Waitress					
Food Prod., Mgmt. & Service					
Manager, Restaurant					
Baking					
Baker					
Chef/Cook					
Cook, Short Order					
Meatcutting					
Butcher, Meat Cutter					
Drycleaning/Laundry Service					
Washer Machine/Starcher					
Shoe & Boot Repair					
Shoe Repairer					
Upholstering					
Furniture Upholsterer					
Custodial Services					
Janitors & Porters					
Executive Housekeeping					
Cleaner, Housekeeping					
Hospitality/Rec. Marketing					
Desk Clerk					
Travel Service Marketing					
Travel Agent/Accommodation					
Public Affairs/Services/Other					
Service Workers					

CLUSTER Program of Training Key Occupation	1985 Employment	1985 Openings	SIC Code	Key Industries	Key CIS Clusters
8. HEALTH	72,812	4,131	80	Health Services	Health Service
			82	Educational Services	
			91	Local Government	
Funeral Services					
Embalmer					
Dental Assisting					
Dental Assistant					
Dental Hygiene					
Dental Hygienist					
Dental Laboratory					
Dental Laboratory Tech.					
Emergency Medical Technology					
Ambulance Attendant					
Radiograph/Nuclear Med. Tech.					
X-Ray Technician					
Respiratory Therapy Technology					
Inhalation Therapist					
Surgical Technology					
Surgical Technician					
Medical Laboratory Technology					
Medical Lab Technologist					
Mental Health Assisting					
Psychiatric Aide					
Medical Assisting					
Medical Assistant					
Nursing Assisting					
Nurse Aide/Orderly					
Practical Nursing					
Licensed Practical Nurse					
Rehabilitation Services					
Physical Therapist					
Occupational Therapy					
Occupational Therapist					
Physical Therapy Assisting					
Physical Therapy Assistant					
Allied Health, Other					
Electrocardiograph Tech.					
Speech Pathology/Audiology					
Speech & Hearing Clinician					

CLUSTER Program of Training Key Occupation	1985 Employment	1985 Open-ings	SIC Code	Key Industries	Key CIS Clusters
8. **HEALTH** (Cont.) Chiropractor Chiropractor Dentistry, General Dentist Medicine, General Physician &/or Surgeon Nursing, General Nurse Professional Optometry Optometrist Pharmacy Pharmacist Veterinary Assisting Veterinary Assistant Veterinary Medicine Veterinarian					
9. **PROTECTIVE SERVICES** Law Lawyer Legal Assisting Paralegal Personnel Law Enforcement Police Patrol Officer Fire Control & Safety Tech. Fire Fighter Private Security Guards & Doorkeepers Military Not Applicable	18,773	1,109	91 92 73 81	Local Government Justice, Public Order & Safety Business Services Legal Services	Social Service Protective Service

CLUSTER Program of Training Key Occupation	1985 Employment	1985 Open-ings	SIC Code	Key Industries	Key CIS Clusters
10. **EDUCATIONAL SERVICES** Elementary Education Teacher Elem. Academic Secondary Education Secondary English Education, Other Teachers Aide Library Science Librarian College Teacher Not Applicable Substitute Teacher Not Applicable	54,224	3,531	82 91	Educational Services Local Government	Social Service
11. **HUMAN SERVICES** Cosmetology/Barbering Cosmetologist Personal Services, Other Reducing Instructor Dietetic/Nutritional Services Dietitian/Nutritionist Religious Education Clergy Social Work, General Case Worker Child Care & Guidance Child-Care Worker Gerontology Not Applicable	14,773	1,002	72 80 83	Personal Services Health Services Social Services	Social Service Personal Care
12. **ELECTRONICS** Electronic Technology Elec./Electronic Tech. Lineworker Line Erector/Installer Communication Electronics Installer, Repairer/Section Maint. Industrial Electronics Electric Motor Repairer	29,064	1,600	36 38 48 508	Electric & Electronic Equipment Instruments & Related Products Communication Machinery, Equipment, Supplies	Elec./Electronics

CLUSTER Program of Training Key Occupation	1985 Employment	1985 Openings	SIC Code	Key Industries	Key CIS Clusters
12. **ELECTRONICS** (Cont.) Major Appliance Repair Household-Appliance Inst. Electromechanical Instr. Repair Electronic Mechanic Electrical/Electronic Assembly Elect./Electronic Assemb. Electromechanical Assembly Electromechanical Assemb. Business Machine Repair Office Mach. Repairer Computer Servicing Tech. Not Applicable					
13. **COMMUNICATIONS** Radio/Television Broadcasting Announcer Bookbinding Bindery Worker Commercial Art Commercial Artist Composition & Typesetting Photo Typesetter Oper. Lithography/Photography Camera Operator Photo Lab & Darkroom Developer Printing Press Offset Lithographic Press Graphic/Communications/Other Photographer Drafting Drafter Air Traffic Control Air Traffic Controller Journalism Not Applicable Visual & Performing Arts Foreign Languages	20,312	1,021	27 48 79 82 891	Printing & Publishing Communication Amusement & Recreation Services Educational Services Engineering, Architectural Services	Social Research Graphic Arts Art & Entertain.

CLUSTER Program of Training Key Occupation	1985 Employment	1985 Open-ings	SIC Code	Key Industries	Key CIS Clusters
14. **INFORMATION PROCESSING or (BUSINESS & OFFICE ADMIN.)** Computer & Console Operation Computer Operator Data Entry Equip. Operation Key Punch Operator Office Supervision & Mgmt. Clerical Supervisor Typing & General Office General Clerk Clerk-Typist Typist/Word Processing Mail & Order Clerk Mail Clerk Receptionist & Communication Switchboard/Receptionist Traffic/Rate/Transport. Clerk Rate Clerk, Freight Business & Office, Other Survey Worker Medical Records Technology Medical Record Tech. Secretarial Secretary Stenographic Stenographer Word Processing Not Applicable	129,821	6,990	43 48 60 80 81 82 91	U. S. Postal Service Communication Banking Health Services Legal Services Educational Services Local Government	Clerical
15. **MECHANICAL TECHNOLOGIES** Mech. Engineering & Tech. Mech. Eng. Technician Heating/Cooling Mech. Refrigeration Mechanic Heavy Equip. Maintenance Mechanic, Maintenance Stationary Energy Sources Boiler Firer	43,263	2,142	24 508 55 75	Lumber & Wood Products Machinery, Equipment, Supplies Automotive Dealers & Service Stations Auto Repair, Services, & Garages	Mechanics

CLUSTER Program of Training Key Occupation	1985 Employment	1985 Open-ings	SIC Code	Key Industries	Key CIS Clusters
15. **MECHANICAL TECHNOLOGIES (Cont.)** Aircraft Mechanics Mechanic Aircraft Automotive Mechanics Mechanic Automotive Diesel Engine Mechanics Diesel Mechanic Mechanics/Repairers, Other Instrument Mechanic Marine Maintenance Motor Boat Mechanic Agricultural Power Machinery Farm Equipment Mechanic Industrial Mechanic Millwright					
16. **OTHER PROFESSIONAL** Technicians Engineering, General Letters Biology, General Mathematics Physical Science Chemistry Social Sciences, General Craft & Kindred Workers	14,663	446	82 91 99	Educational Services Local Government Federal Government	Administrative Social Research Math & Computing Engineer. & Design Science & Lab.
17. **OTHER MANUFACTURING** Operatives Packing Workers Operatives, Other Assemblers Laborers, Except Farm Other	145,548	8,794	20 22 23 34	Food & Kindred Prod. Textile Mill Products Apparel & Textile Products Fabricated Metal Products	Food Processing Textile & Apparel Other Production

CLUSTER Program of Training Key Occupation	1985 Employment	1985 Open- ings	SIC Code	Key Industries	Key CIS Clusters
17. **OTHER MANUFACTURING** (Cont.)					
Textile Production					
Weaver					
Comm. Garment Construction					
Sewing Mach. Operator					

0022D

CLUSTER: Natural Resources Management

1985 Employment 54,364 1985 Openings 2,435 1984 Unemployed 10,443

DESCRIPTION: Includes occupations concerned with the production, propagation, gathering, and catching of animals (land and aquatic), animal products, plant products (crop, timber, and ornamental); the provision of services associated with agricultural production, game farms, fisheries, wild life conservation, and mining.

KEY OREGON INDUSTRIES: 2 digit SIC (Standard Industrial Classification) Codes and Titles

01 Agricultural Production--Crops
02 Agricultural Production--Livestock
07 Agricultural Services
08 Forestry
09 Fishing, Hunting, & Trapping
12 Bituminous Coal & Lignite Mining
14 Nonmetallic Minerals, except Fuels
24 Lumber & Wood Products
91 Local Government
99 Federal Government

TYPES OF WORK PERFORMED: Work varies from controlled exploration of fundamental areas of knowledge and the management of resources to securing, producing, and cultivating raw materials, products, or animals. Many workers also work with machines, hand tools to cut and shape wood and assemble a variety of products. Much of the work is done outdoors.

WORKER APTITUDES AND INTERESTS:

OAP (Occupational Aptitude Pattern)	GOE (Guide for Occupational Exploration)
08 Life Sciences	02.02 Discover, collect, analyze information about natural world.
11 Managerial Work: Plants & Animals	03.01 Operating business. 03.02 General Supervision, Plants & Animals: Assign duties to workers and organize production.
14 Elemental Work: Plants & Animals	03.04 Work outside and perform tasks requiring physical strength.

CLUSTER: Natural Resources Management (Continued)

32 Production Work

34 Elemental Work: Industrial

06.02 Operate machines, assemble, use hands, tend machines.

06.04 Assemble parts, follow established procedures with little change.

PROGRAMS OF TRAINING:

Agricultural Business & Mgmt.
Agricultural Production
Animal Production
Agri. Products & Processing
Horticulture, General
Slaughtering & Butchering
Farm Workers
Conventional Energy Sources
Papergoods Mach. Operator
Planing Mill Operations
Wood Turning Operations
Woodworking, Other
Sawmilling
Veneer & Plywood
Logging
Pulp & Paper
Forest Products, Other
Forestry & Related Science
Sanitation Technology
Heavy Equipment Operation
Commercial Fishing

KEY OCCUPATIONS:

County Agr. Ext. Agent
Farm Equipment Operator
Livestock Breeder
Food Miller
Gardener & Groundskeeper
Poultry Dresser
Livestock Handler
Substation Operator
Slitter Machine Oper.
Sander, Wood
Wood Working Mach. Oper.
Lumber Grader
Cut-off Saw Operator
Core Layer
Faller/Bucker
Back Tender
Hook & Chainer
Forest Conservation Worker
Sewage Plant Operator
Yarder Engineer
Deckhand, Fishing Vessel

CLUSTER: Construction

1985 Employment 36,186 1985 Openings 2,435 1984 Unemployed 12,869

DESCRIPTION: Includes occupations concerned with fabricating, installing, and repairing structures. Some occupations are also concerned with installing gas, steam, plumbing, and related fixtures. Work is normally performed at a specific site, which will change over time. This is in contrast to production workers, where the work normally is delivered to the worker at a fixed location. Although the skills involved in the several programs of training are varied, they have been classified together because of common work sites. Occupations in this cluster are primarily concerned with working on materials.

KEY OREGON INDUSTRIES: 2 digit SIC (Standard Industrial Classification) Codes and Titles

15 General Building Contractors
16 Heavy Construction Contractors
17 Special Trade Contractors

TYPES OF WORK PERFORMED: Work includes engineering, surveying, installing or repairing interior or exterior structures, electrical and plumbing installation, shaping metal and plastics, working with brick, cement, mortar, stone to build or repair structural parts, and the moving of materials by hand or with heavy equipment.

WORKER APTITUDES AND INTERESTS:

OAP (Occupational Aptitude Pattern)	GOE (Guide for Occupational Exploration)	
17 Engineering	05.01	Use computers to conduct research to solve construction problems. Plan and design roads and bridges.
19 Engineering Technology	05.03	Measure and prepare maps, inspect buildings and equipment. Perform detail work.
21 Craft Technology	05.05	Skillfully use hand tools or machines, read blueprints. Measure, cut materials.

CLUSTER: Construction (Continued)

26 Crafts	05.10 Use arithmetic to measure and compute the amount of materials needed. Use hands and hand tools with skill.
28 Equipment Operation	05.11 Operate machines, assemble, use hands, tend machines.
29 Elemental Work: Mechanical	05.12 Use hands to lift, carry, or pull heavy objects, like to work outdoors. Perform the same task repeatedly.

PROGRAMS OF TRAINING:	KEY OCCUPATIONS:
Civil Technology	Civil Engineer
Tile & Masonry	Brick Layer
Carpentry	Carpenter
Construction Inspection	Construction Inspector
Glazing	Glazier
Painting & Decorating	Painter Maintenance
Plastering	Plasterer
Roofing	Roofer
Construction Trades, Other	Cement Mason
Plumbing & Pipefitting	Plumber/Pipefitter
Millwork & Cabinet Maker	Cabinet Maker
Construction Equip. Operation	Heavy Equip. Operator
Electrician	Electrician

CLUSTER: Metals

1985 Employment 27,853 1985 Openings 1,932 1984 Unemployed 6,458

DESCRIPTION: Includes occupations concerned with setting up, operating, and tending machines and hand production work that involves the use of metal and plastic materials.

KEY OREGON INDUSTRIES: 2 digit SIC (Standard Industrial Classification) Codes and Titles

30 Plastics
33 Primary Metal Industries
34 Fabricated Metal Products
35 Machinery, except Electrical

TYPES OF WORK PERFORMED: Work involves the compounding, melting, heat conditioning, and shaping metal and plastics. May work with machines or hand tools to cut and shape, bore, weld metal or plastics.

WORKER APTITUDES AND INTERESTS:

OAP (Occupational Aptitude Pattern)	GOE (Guide for Occupational Exploration)
21 Craft Technology	05.05 Skillfully use hand tools or machines. Read blueprints, measure, cut materials.
31 Production Technology	06.01 Set up and operate a lathe to cut and form metal.
32 Production Work	06.02 Operate machines, assemble, use hands, tend machines.
34 Elemental Work: Industrial	06.04 Assemble parts, follow established procedures, little change.

PROGRAMS OF TRAINING:	KEY OCCUPATIONS:
Industrial Technology	Industrial Engineer
Metallurgical Technology	Metallurgist/Metal Engr.
Watch Repair	Watch Maker
Automotive Body Repair	Body Repairer, Automotive
Foundry	Furnace Operator

CLUSTER: Metals (Continued)

Machine Shop/Tool Operation	Machinist
Sheet Metal	Sheet Metal Worker
Welding/Brazing/ & Soldering	Welders & Flamecutters
Precision Metal Work, Other	Tool & Die Maker
Jewelry Design & Repair	Jeweler/Silversmith
Plastics	Compression/Injection Mold

CLUSTER: Transportation & Trade

1985 Employment 26,118 1985 Openings 1,172 1984 Unemployed 6,501

DESCRIPTION: Includes occupations concerning the operating and controlling of equipment used to facilitate the movement of people or materials and the supervising of those workers.

KEY OREGON INDUSTRIES: 2 digit SIC (Standard Industrial Classification) Codes and Titles

40 Rail Road Transportation
41 Local & Inter-urban Passenger Transit
42 Trucking & Warehousing
44 Water Transportation

TYPES OF WORK PERFORMED: Moving materials (in solid, liquid, or gaseous forms) or people, by hand or by machine power. Persons may also provide or effect the transmission of information to other persons, indirectly (by electrical or electronic media) or directly (by voice or written statement).

WORKER APTITUDES AND INTERESTS:

OAP (Occupational Aptitude Pattern)	GOE (Guide for Occupational Exploration)	
19 Engineering Technology	05.03	Use clear language, coordinate eyes, fingers, and hands to operate equipment. Make quick decisions.
20 Air & Water Vehicle Operation	05.04	Use judgment to make decisions that affect the lives of passengers. Understand and use procedures for controlling transportation vehicles.
23 Land & Water Vehicle Operation	05.08	Drive a vehicle for long periods of time. Collect money to make change.
47 Passenger Services	09.03	Think, reason, and act quickly. Memorize routes, speak and give information to passengers.

CLUSTER: Transportation & Trade (Continued)

PROGRAMS OF TRAINING:	KEY OCCUPATIONS:
Truck/Bus/Taxi Driving	Truck Driver
Deckhands & Sailors	Able Seaman
Rail Transportation	Braker
Airplane Pilot/Navigation	Airplane Pilot

CLUSTER: Marketing

1985 Employment 150,848 1985 Openings 9,020 1984 Unemployed 17,654

DESCRIPTION: Includes occupations concerned with selling goods and services, purchasing commodities and property for resale and conducting wholesale and retail businesses on own or owners' behalf or in partnership.

KEY OREGON INDUSTRIES: 2 digit SIC (Standard Industrial Classification) Codes and Titles

50 Wholesale Trade--Durable Goods
51 Wholesale Trade--Nondurable Goods
53 General Merchandise Stores
54 Food Stores
65 Real Estate

TYPES OF WORK PERFORMED: Work includes evaluating or estimating the quality, quantity, and value of things. Many workers also receive, store, issue, ship, requisition, and account for stores of materials. Work may involve preparing and maintaining verbal and numerical records and dealing with people to provide service.

WORKER APTITUDES AND INTERESTS:

OAP (Occupational Aptitude Pattern)	GOE (Guide for Occupational Exploration)	
24 Materials Control	05.09	Verify inventory records against actual count of items.
36 Mathematical Detail	07.02	Compute or verify credit card data to keep customer accounts.
37 Financial Detail	07.03	Use math to figure cost and make change.
42 Sales Technology	08.01	Understand technical principles as they relate to the products bought or sold.
43 General Sales	08.02	Talk easily and persuasively to other people, using language they understand.

CLUSTER: Marketing (Continued)

PROGRAMS OF TRAINING:

Marketing Mgmt. & Research
Real Estate, General
Financial Services Marketing
Sales
Insurance Marketing, General
Advertising
Auto. Vehicle/Access. Mktg.

KEY OCCUPATIONS:

Market Research Analyst
Sales Agent, Real Estate
New Account Teller
Sales Representative
Sales Agent, Insurance
Public Relations Practice
Manager, Parts Dept.

CLUSTER: Business Management (Support)

1985 Employment 63,916 1985 Openings 3,776 1984 Unemployed 5,858

DESCRIPTION: Includes occupations concerned with the gathering, systemizing, and preparing of various kinds of information necessary for business and administrative activity.

KEY OREGON INDUSTRIES: 2 digit SIC (Standard Industrial Classification) Codes and Titles

60 Banking
73 Business Services
86 Membership Organizations
893 Accounting, Auditing & Bookkeeping
93 Finance, Taxation & Monetary Policy

TYPES OF WORK PERFORMED: Work includes the preparing and maintaining of verbal and numerical records as well as receiving, storing, issuing, shipping, requisitioning, and accounting for stores of materials. Several occupations in this cluster require dealing with people to provide administrative services.

WORKER APTITUDES AND INTERESTS:

OAP (Occupational Aptitude Pattern)	GOE (Guide for Occupational Exploration)	
24 Materials Control	05.09	Verify inventory records against actual count of items.
36 Mathematical Detail	07.02	Compute or verify credit card data to keep customer accounts.
52 Mathematics & Statistics	11.01	Use computer technology to solve problems or process large amounts of information.
59 Business Administration	11.05	Understand and use mathematical concepts in order to design a financial or economic system.

CLUSTER: Business Management (Support) (Continued)

PROGRAMS OF TRAINING:	KEY OCCUPATIONS:
Accounting	Accountants & Auditors
Bookkeeping	Bookkeeper, Hand
Machine Billing/Bookkeeping	Bookkeeping & Billing Mach. Op.
Data Programming	Computer Programmer
Systems Analysis	System Analyst
Personnel & Training Prog.	Personnel & Labor Relation
Shipping/Receiving Stock Clerk	Stock Clerk Storeroom
Purchasing Agents & Buyers	

CLUSTER: Hospitality & Recreation

1985 Employment 143,804 1985 Openings 9,354 1984 Unemployed 16,875

DESCRIPTION: Includes occupations that help visitors, travelers, customers get acquainted with and feel at ease in an unfamiliar setting. Includes service occupations concerned with food service, the transportation, and the maintenance of facilities.

KEY OREGON INDUSTRIES: 2 digit SIC (Standard Industrial Classification) Codes and Titles

70 Hotels & Other Lodging Places
47 Transportation Services
58 Eating & Drinking Places
79 Amusement & Recreation Services
82 Educational Services

TYPES OF WORK PERFORMED: Work includes waiting on and escorting people in recreational settings. May greet and seat customers, serve meals and beverages, conduct tours, clean facilities, or plan social activities.

WORKER APTITUDES AND INTERESTS:

OAP (Occupational Aptitude Pattern)	GOE (Guide for Occupational Exploration)
26 Crafts	05.10 Prepare and cooks soups, meats, vegetables, desserts, and other foods.
29 Elemental Work: Mechanical	05.12 Use hands to lift, carry, or pull heavy objects.
38 Oral Communications	07.04 Use personal judgment and specialized knowledge to give information to people.
43 General Sales	08.02 Talk easily and persuasively to other people using language they understand.
45 Hospitality Services	09.01 Have day-to-day contact with the public.

CLUSTER: Hospitality & Recreation (Continued)

48 Attendant Services

09.05 Lift and carry such things as luggage, trays of dishes, and bags of golf clubs.

PROGRAMS OF TRAINING:	KEY OCCUPATIONS:
Food Products	Cheese Maker
Waiter/Waitress/Related Service	Waiter/Waitress
Food Prod., Mgmt. & Service	Manager, Restaurant
Baking	Baker
Chef/Cook	Cook, Short Order
Meatcutting	Butcher, Meat Cutter
Drycleaning/Laundry Service	Washer Machine/Starcher
Shoe & Boot Repair	Shoe Repairer
Upholstering	Furniture Upholsterer
Custodial Services	Janitors & Porters
Executive Housekeeping	Cleaner, Housekeeping
Hospitality/Rec. Marketing	Desk Clerk
Travel Service Marketing	Travel Agent/Accommodation
Public Affairs/Services/Other	Service Workers

CLUSTER: Health

1985 Employment 72,812 1985 Openings 4,131 1984 Unemployed 13,259

DESCRIPTION: Includes occupations concerned with preventing and diagnosing human and animal ailments, prescribing and giving medical and surgical treatment for diseases and illnesses. Also includes occupations concerned with the maintenance of health, the prevention of illness and the care of the ill through the provision and supervision of nursing care, compounding drugs; planning food service or nutritional programs; and the provision of therapy and treatment.

KEY OREGON INDUSTRIES: 2 digit SIC (Standard Industrial Classification) Codes and Titles

80 Health Services
82 Educational Services
91 Local Government

TYPES OF WORK PERFORMED: Work varies with type of health service performed. Most work involves healing, caring, providing information, evaluating or planning care programs. Work involves using considerable judgmental skills and making decisions that directly affect others.

WORKER APTITUDES AND INTERESTS:

OAP (Occupational Aptitude Pattern)	GOE (Guide for Occupational Exploration)	
9 Medical Sciences	02.03	Use logic and scientific thinking to diagnose and treat human or animal injuries and illnesses.
10 Laboratory Technology	02.04	Set up and operate laboratory equipment to conduct tests.
50 Nursing, Therapy & Specialized Teaching	10.02	Provide direct services to persons with problems.
51 Child & Adult Care	10.03	Prepare patients for examination.

CLUSTER: Health (Continued)

PROGRAMS OF TRAINING:	KEY OCCUPATIONS:
Funeral Services	Embalmer
Dental Assisting	Dental Assistant
Dental Hygiene	Dental Hygienist
Dental Laboratory	Dental Laboratory Tech.
Emergency Medical Technology	Ambulance Attendant
Radiograph/Nuclear Med. Tech.	X-Ray Technician
Respiratory Therapy Technology	Inhalation Therapist
Surgical Technology	Surgical Technician
Medical Laboratory Technology	Medical Lab Technologist
Mental Health Assisting	Psychiatric Aide
Medical Assisting	Medical Assistant
Nursing Assisting	Nurse Aide/Orderly
Practical Nursing	Licensed Practical Nurse
Rehabilitation Services	Physical Therapist
Occupational Therapy	Occupational Therapist
Physical Therapy Assisting	Physical Therapy Assistant
Allied Health, Other	Electrocardiograph Tech.
Speech Pathology/Audiology	Speech & Hearing Clinician
Chiropractor	Chiropractor
Dentistry, General	Dentist
Medicine, General	Physician &/or Surgeon
Nursing, General	Nurse Professional
Optometry	Optometrist
Pharmacy	Pharmacist
Veterinary Assisting	Veterinary Assistant
Veterinary Medicine	Veterinarian

CLUSTER: Protective Services

1985 Employment 18,773 1985 Openings 1,109 1984 Unemployed 1,312

DESCRIPTION: Includes occupations concerned with protecting people, animals, and property. Enforce laws, investigate suspicious persons and acts, prevent crime, and fight fires.

KEY OREGON INDUSTRIES: 2 digit SIC (Standard Industrial Classification) Codes and Titles

91 Local Government
92 Justice, Public Order & Safety
73 Business Services
81 Legal Services

TYPES OF WORK PERFORMED: Work involves enforcing laws and regulations, some investigate crimes, while others protect life or property. May have to use authority to control people in a variety of settings.

WORKER APTITUDES AND INTERESTS:

OAP (Occupational Aptitude Pattern)	GOE (Guide for Occupational Exploration)
15 Safety & Law Enforcement	04.01 Work with laws and regulations. Use guns, fire-fighting equipment, and other safety devices.
16 Security Services	04.02 Use reason and judgment in dealing with all kinds of people.
57 Law & 58	11.04 Understand, interpret, and apply legal procedures, principles, and laws.

PROGRAMS OF TRAINING:

Law
Legal Assisting
Law Enforcement
Fire Control & Safety Tech.
Private Security
Military

KEY OCCUPATIONS:

Lawyer
Paralegal Personnel
Police Patrol Officer
Fire Fighter
Guards & Doorkeepers

CLUSTER: Educational Services

1985 Employment 54,224 1985 Openings 3,531 1984 Unemployed 1,635

DESCRIPTION: Includes occupations concerned with direct contact with individuals to provide for their education or training in an educational institution. Included are librarians and educational and vocational counselors.

KEY OREGON INDUSTRIES: 2 digit SIC (Standard Industrial Classification) Codes and Titles

82 Educational Services
91 Local Government

TYPES OF WORK PERFORMED: Workers in this group do general and special teaching. They introduce students to basics of mathematics, language, science, social studies, etc. Teachers also keep track of their students social and health development and may coach children or youth in sports activities. Teachers prepare lessons, grade papers and supervise class activities.

WORKER APTITUDES AND INTERESTS:

OAP (Occupational Aptitude Pattern)	GOE (Guide for Occupational Exploration)
49 Social Services	10.01 Influence the opinions and decisions of others.
50 Nursing, Therapy & Specialized Teaching	10.02 Provide direct services to persons with problems.
53 Educational & Library Services	11.02 Present ideas and information to others.

PROGRAMS OF TRAINING:

Elementary Education
Secondary Education
Education, Other
Library Science
College Teacher
Substitute Teacher

KEY OCCUPATIONS:

Teacher Elem. Academic
Secondary English
Teachers Aide
Librarian

CLUSTER: Human Services

1985 Employment 14,773 1985 Openings 1,002 1984 Unemployed 1,215

DESCRIPTION: Includes occupations concerned with performing a variety of tasks for other people. Services vary from improving the appearance or physical condition of patrons to helping people deal with their personal problems. Workers in this group are concerned with the physical needs and welfare of others.

KEY OREGON INDUSTRIES: 2 digit SIC (Standard Industrial Classification) Codes and Titles

72 Personal Services
80 Health Services
83 Social Services

TYPES OF WORK PERFORMED: Work includes cutting and styling hair, giving massages, or providing instruction on appearance, physical conditioning or diet. Many human service occupations require the skilled use of counseling or teaching techniques. Work involves the day to day contact with the public.

WORKER APTITUDES AND INTERESTS:

OAP (Occupational Aptitude Pattern)	GOE (Guide for Occupational Exploration)	
46 Barber & Beauty Services	09.02	Adapt procedures to an individual customer's physical features.
48 Attendant Services	09.05	Use hands and fingers skillfully when performing tasks such as rub-downs, manicuring fingernails.
49 Social Services	10.01	Uses special training to counsel others or help them solve personal problems.
51 Child & Adult Care	10.03	Care for children in a day care facility.

PROGRAMS OF TRAINING:

Cosmetology/Barbering
Personal Services, Other
Dietetic/Nutritional Services

KEY OCCUPATIONS:

Cosmetologist
Reducing Instructor
Dietitian/Nutritionist

CLUSTER: Human Services (Continued)

Religious Education	Clergy
Social Work, General	Case Worker
Child Care & Guidance	Child-Care Worker
Gerontology	

CLUSTER: Electronics

1985 Employment 29,064 1985 Openings 1,600 1984 Unemployed 3,138

DESCRIPTION: Includes occupations concerned with the development and use of electrical and electronic devices.

KEY OREGON INDUSTRIES: 2 digit SIC (Standard Industrial Classification) Codes and Titles

36 Electric & Electronic Equipment
38 Instruments & Related Products
48 Communication
508 Machinery, Equipment, Supplies

TYPES OF WORK PERFORMED: Work varies from the research and development activities that create new electronic equipment and devices to the assembly of products. Many occupations in this group also must use basic or advanced knowledge of electronics to diagnose and repair machines that use electronic components.

WORKER APTITUDES AND INTERESTS:

OAP (Occupational Aptitude Pattern)	GOE (Guide for Occupational Exploration)	
17 Engineering	05.01	Use computers to conduct research to solve technical problems.
21 Craft Technology	05.05	Use arithmetic to figure materials needed, dimensions to be followed, and costs of materials.
26 Crafts	05.10	Understand and use blueprints, sketches, drawings, and other kinds of specifications.
32 Production Work	06.02	Use eyes, hands, and fingers to adjust controls on machines, manipulate hand tools, or assemble products.

CLUSTER: Electronics (Continued)

PROGRAMS OF TRAINING:	KEY OCCUPATIONS:
Electronic Technology	Elec./Electronic Tech.
Lineworker	Line Erector/Installer
Communication Electronics	Installer, Rep./Sect.
Industrial Electronics	Electric Motor Repairer
Major Appliance Repair	Household-Appliance Inst.
Electromechanical Instr. Repair	Electronic Mechanic
Electrical/Electronic Assembly	Elect./Electronic Assemb.
Electromechanical Assembly	Electromechanical Assemb.
Business Machine Repair	Office Mach. Repairer
Computer Servicing Tech.	

CLUSTER: Communications

1985 Employment 20,312 1985 Openings 1,021 1984 Unemployed 1,882

DESCRIPTION: Includes occupations concerned with the transmittal of information using a variety of media. Technical knowledge of the type of media device or mode of transmittal used may be required. Occupations in this group may also require special physical or artistic skills.

KEY OREGON INDUSTRIES: 2 digit SIC (Standard Industrial Classification) Codes and Titles

27 Printing & Publishing
48 Communication
79 Amusement & Recreation Services
82 Educational Services
891 Engineering, Architectural Services

TYPES OF WORK PERFORMED: Provides, or effects the transmission of information to other persons, indirectly (by electrical or electronic media) or directly (by voice or written statement). May develop graphic information for use in design or production of structures or systems. Creative work is required of most of the occupations in this group.

WORKER APTITUDES AND INTERESTS:

OAP (Occupational Aptitude Pattern)	GOE (Guide for Occupational Exploration)
01 Literary Arts	01.01 Influence the opinions of people through words.
02 Visual Arts	01.02 Choose the most appropriate equipment to express an idea or create a particular effect.
03 Performing Arts	01.03 Perform before an audience with poise and self-confidence.
19 Engineering Technology	05.03 Use clear language. Coordinate eyes, fingers, and hands to operate equipment. Make quick decisions.

CLUSTER: Communications (Continued)

26 Crafts

05.10 Visualize how a finished product will look, or how a system operates.

PROGRAMS OF TRAINING:

Radio/Television Broadcasting
Bookbinding
Commercial Art
Composition & Typesetting
Lithography/Photography
Photo Lab & Darkroom
Printing Press
Graphic/Communications/Other
Drafting
Air Traffic Control
Journalism
Visual & Performing Arts
Foreign Languages

KEY OCCUPATIONS:

Announcer
Bindery Worker
Commercial Artist
Photo Typesetter Oper.
Camera Operator
Developer
Offset Lithographic Press
Photographer
Drafter
Air Traffic Controller

CLUSTER: Information Processing or*
(Business & Office Admin.)

1985 Employment 129,821 1985 Openings 6,990 1984 Unemployed 13,126

DESCRIPTION: Includes occupations concerned with preparing, transcribing, transferring, systematizing, and preserving written communications and records; gathering and distributing information; operates office machines and electronic data-processing equipment; operating telephone switchboards, distributing mail and delivering messages; and performing other clerical duties.

KEY OREGON INDUSTRIES: 2 digit SIC (Standard Industrial Classification) Codes and Titles

43 U. S. Postal Service
48 Communication
60 Banking
80 Health Services
81 Legal Services
82 Educational Services
91 Local Government

TYPES OF WORK PERFORMED: Work includes preparing and maintaining verbal and/or numerical records. In addition workers use logical thinking and personal judgment to perform a variety of office tasks that require special skills and knowledge.

WORKER APTITUDES AND INTERESTS:

OAP (Occupational Aptitude Pattern)	GOE (Guide for Occupational Exploration)	
35 Administrative Detail	07.01	Change work activities frequently; for example, typing, interviewing, taking dictation, supervising others.
38 Oral Communications	07.04	Use personal judgment and specialized knowledge to give information to people.
40 Clerical Machine Operation	07.06	Use eyes, hands, and fingers to operate the keyboard of a clerical machine quickly and accurately.

CLUSTER: Information Processing or*
(Business & Office Admin.) (Continued)

41 Clerical Handling

07.07 Routinely file, sort, route, or deliver items such as letters, packages, or messages.

PROGRAMS OF TRAINING:

Computer & Console Operation
Data Entry Equip. Operation
Office Supervision & Mgmt.
Typing & General Office
Clerk-Typist
Mail & Order Clerk
Receptionist & Communication
Traffic/Rate/Transport. Clerk
Business & Office, Other
Medical Records Technology
Secretarial
Stenographic
Word Processing

KEY OCCUPATIONS:

Computer Operator
Key Punch Operator
Clerical Supervisor
General Clerk
Typist/Word Processing
Mail Clerk
Switchboard/Receptionist
Rate Clerk, Freight
Survey Worker
Medical Record Tech.
Secretary
Stenographer

*The Cluster Review Advisory Committee was divided on these two titles.

CLUSTER: Mechanical Technologies

1985 Employment 43,263 1985 Openings 2,142 1984 Unemployed 6,361

DESCRIPTION: Includes occupations concerned with the adjustment, maintenance, part replacement, and repair of tools, equipment, and machines. The installation and inspection of such equipment may also be required job duties.

KEY OREGON INDUSTRIES: 2 digit SIC (Standard Industrial Classification) Codes and Titles

24 Lumber & Wood Products
508 Machinery, Equipment, Supplies
55 Automotive Dealers & Service Stations
75 Auto Repair, Services, & Garages

TYPES OF WORK PERFORMED: Work includes using hand tools and electronic equipment to maintain, repair, and install machines and technological systems. Mechanics and repairers must keep up to date by studying new repair books, technical manuals and attending classes. Much of the work includes diagnosing the causes of equipment failure and finding cost effective solutions.

WORKER APTITUDES AND INTERESTS:

OAP (Occupational Aptitude Pattern)	GOE (Guide for Occupational Exploration)	
17 Engineering	05.01	Conduct research to develop new and improved manufacturing processes.
21 Craft Technology	05.05	Skillfully use the hand tools or machines to make repairs.
26 Crafts	05.10	Visualize how a finished product will look, or how a system operates.
29 Elemental Work: Mechanical	05.12	Use hands to lift, carry, or pull heavy objects.

PROGRAMS OF TRAINING:

Mech. Engineering & Tech.
Heating/Cooling Mech.

KEY OCCUPATIONS:

Mech. Eng. Technician
Refrigeration Mechanic

CLUSTER: Mechanical Technologies (Continued)

Heavy Equip. Maintenance	Mechanic Maintenance
Stationary Energy Sources	Boiler Firer
Aircraft Mechanics	Mechanic Aircraft
Automotive Mechanics	Mechanic Automotive
Diesel Engine Mechanics	Diesel Mechanic
Mechanics/Repairers, Other	Instrument Mechanic
Marine Maintenance	Motor Boat Mechanic
Agricultural Power Machinery	Farm Equipment Mechanic
Industrial Mechanic	Millwright

CLUSTER: Other Professional

1985 Employment 14,663 1985 Openings 446 1984 Unemployed 810

DESCRIPTION: Includes professional and technical occupations not classified under the fifteen secondary education clusters. Most of these occupations require advanced and highly specialized training.

KEY OREGON INDUSTRIES: 2 digit SIC (Standard Industrial Classification) Codes and Titles

82 Educational Services
91 Local Government
99 Federal Government

TYPES OF WORK PERFORMED: Work includes using scientific principles, math and statistics to conduct research and solve technical problems. Many occupations in this group also are involved in teaching specialized subject matter.

WORKER APTITUDES AND INTERESTS:

OAP (Occupational Aptitude Pattern)	GOE (Guide for Occupational Exploration)	
07 Physical Sciences	02.01	Use logic or scientific thinking to deal with many different kinds of problems.
08 Life Sciences	02.02	Discover, collect, analyze information about natural world.
10 Laboratory Technology	02.04	Set up and update laboratory equipment to conduct tests.
17 Engineering	05.01	Use computers to conduct research to solve technical problems.
52 Mathematics & Statistics	11.01	Use technical terms, math and computer symbols, and complex charts and graphs.
53 Educational & Library Services	11.02	Present ideas and information to others.

CLUSTER: Other Professional (Continued)

55 Social Research

11.03 Analyze both current and historical information that relates to the research subject.

PROGRAMS OF TRAINING:

Technicians
Engineering, General
Letters
Biology, General
Mathematics
Physical Science
Chemistry
Social Sciences, General
Craft & Kindred Workers

KEY OCCUPATIONS:

None assigned.

CLUSTER: Other Manufacturing

1985 Employment 43,683 1985 Openings 2,142 1984 Unemployed 17,843

DESCRIPTION: Includes semi-skilled and unskilled occupations concerned with setting up, operating, and tending machines and hand production work.

KEY OREGON INDUSTRIES: 2 digit SIC (Standard Industrial Classification) Codes and Titles

20 Food & Kindred Prod.
22 Textile Mill Products
23 Apparel & Textile Products
34 Fabricated Metal Products

TYPES OF WORK PERFORMED: Work includes working with machines and hand tools to cut and shape materials; processing various materials in solid, fluid, semi-fluid, or gaseous states, during production process or to prepare for distribution; converting fiber raw stock into yarn and thread, and interlacing and otherwise working yarns to form woven, non-woven, and knitted fabrics.

WORKER APTITUDES AND INTERESTS:

OAP (Occupational Aptitude Pattern)	GOE (Guide for Occupational Exploration)
29 Elemental Work: Mechanical	05.12 Use hands to lift, carry, or pull heavy objects. Like to work outdoors. Perform the same task repeatedly.
32 Production Work	06.02 Operate machines, assemble, use hands, tend machines.
34 Elemental Work: Industrial	06.04 Assemble parts, follow established procedures with little change.

PROGRAMS OF TRAINING:

Textile Production
Comm. Garment Construction
Operatives
Packing Workers
Operatives, Other
Assemblers
Laborers, Except Farm
Other

KEY OCCUPATIONS:

Weaver
Sewing Mach. Operator

CLUSTER REVISION CONSIDERATIONS

The Cluster Review Advisory Committee proposed several important considerations which they believed fundamental to any changes in the present cluster approach. These considerations, in the view of project staff also, are key to successful implementation of cluster revisions.

1. Clusters should provide options for ALL students.
2. High school and community college programs should be matched to strengthen articulation.
3. Local options to custom design cluster programs should be available and encouraged.
4. Common competencies for each cluster should be identified on the basis of task analysis.
5. Revised clusters will be taught with existing staff. This has implications for inservice and the need to involve vocational teachers in the implementation of cluster changes.
6. Cluster revisions may be impacted by textbook publishing schedules and availability of other instructional materials.
7. Clusters should be responsive to local conditions, e.g. school size, unique industry configurations.
8. Cluster revisions should protect existing good programs.
9. It should be clearly specified which clusters are industry-based and which are occupationally-based.
10. Clusters should be planned from a broader perspective than federal funding requirements and constraints.
11. Clusters should specify how they can meet the needs of students who will enter the labor force directly and those who will continue their education.
12. Each cluster should have math, science, technology and communications components.
13. Apprenticeship linkages to clusters should be identified, including adequate math preparation.
14. Combinations of broad cluster categories may best meet the needs of small schools.

In addition, the advisory committee raised five questions that will be central to implementation of cluster changes. They include the following:

1. Should the statewide or local economy be the basis of labor market need?
2. How should the size of demand be related to cluster configurations?
3. What are the relationships between the general curriculum and vocational education?
4. How can clusters address the fact that many skills and technologies are applicable to several clusters?
5. How can cluster content be better related to other applied areas?

OPPS and OOICC propose recommendations for responses to two of these questions. The others are curricular in nature and should be addressed by the Division of Vocational Education and local vocational and general administrators.

Regular secondary cluster programs should be based on statewide labor market needs. Once revised clusters have been approved, schools or districts planning to implement these new programs should not be required to submit documentation of labor market need.

Special vocational programs which are designed to meet unique local industry configurations and needs, however, should present documentation of labor market need in the program application. It is suggested that OPPS staff review these applications in the same manner as are community college program applications.

The size of demand per se should not be the fundamental criteria for cluster identification. Each of the proposed clusters represents

sizeable occupational demand, but arbitrary and artificial minimums do not appear defensible. OPPS and OOICC suggest that the Employment Outlook methodology, applied to the key occupations, offers a better indication of employment opportunities. This methodology uses both demand and supply and includes short and long term factors. After analyzing the key occupations in each cluster, labor market analysts and program specialists could determine which clusters, or portions thereof, should be offered during a given year or planning cycle.

RECOMMENDATIONS FOR IMPLEMENTATION OF CLUSTER REVISIONS

Proposing revisions to the cluster system based primarily on labor market considerations is only the beginning of the process of change. Based on contacts with the Cluster Review Advisory Committee, project staff make the following recommendations for implementation of changes in the clusters.

1. Vocational program specialists must become knowledgeable about and supportive of the rationale for changes in clusters.
2. State level technical committees must become involved in the process of change, providing industry input.
3. Presentations should be made to policy making and advisory bodies such as the Oregon Board of Education, the State Advisory Council for Career and Vocational Education, the Oregon Educational Coordinating Commission, the Oregon Occupational Information Coordinating Committee and the Council of Instructional Administrators.
4. Presentations should be made to professional associations, including the Confederation of Oregon School Administrators, Oregon Association of Secondary School Administrators, Oregon Community College Association, Oregon Personnel and Guidance Association, Oregon School Boards Association, and the Oregon Small Schools Association. Each affiliate of the Oregon Vocational Association and its Executive Board should be contacted and presentations made at conferences, workshops and seminars to involve vocational teachers and administrators directly in the change process.

5. The Division of Vocational Education should develop policies and formulate responses to the considerations and questions raised by the Cluster Review Advisory Committee prior to submitting suggested cluster changes to policy, advisory and professional groups.

6. When agreement on cluster configuration has been reached, training of teachers, administrators and counselors will be extremely important. Cooperation among ODE and OPPS staff and the Regional Coordinators in designing and providing training is crucial to successful implementation of cluster changes.

7. The Division of Vocational Education must thoroughly study the effects of cluster changes on internal and external operating systems, particularly the Secondary Reporting of Vocational Enrollment (SERVE) system, curriculum acquisition and development, program assessment and evaluation, staff assignments and technical committee composition.

8. The Oregon Occupational Information Coordinating Committee must determine necessary changes to be made in the organization and delivery of the Occupational Program Planning System. Supplemental funding to support programming changes may be sought as necessary.

9. Descriptions of key occupations should be reviewed for accuracy and completeness by technical and/or program advisory committees. OPPS and OOICC would be willing to cooperate with the Department of Education to fund an analyst to update job descriptions and to make initial efforts to document new and emerging occupations as required by the Perkins Vocational Education Act.

RECOMMENDATIONS FOR CLUSTER ASSESSMENT

From a labor market perspective, the Employment and Program Development Outlook methodologies developed by OPPS and OOICC offer the most objective and consistent basis for cluster assessment. These methodologies incorporate the long range industry and occupational projections and current labor market factors such as the unemployment rate to determine the likelihood of placement in occupations related to training programs.

It is recommended that the Employment Outlook for each cluster be assessed every three years to coincide with the completion of the

Occupational Employment Statistics survey cycle. This assessment should be cooperatively done by the program specialists and labor market analysts, involving industry advisory teams as necessary.

The Employment Outlook indicators include the following:

Employment
Openings (Growth and replacement)
Ratio of unemployed to projected openings
Unemployment rate
Turnover

Program Development Outlook indicators include the following:

Employment per occupation in the cluster or training program
Openings per occupation in the cluster or training program
Ratio of growth openings to employment (i.e. growth rate)
Ratio of unemployed to openings
Unemployment rate
Ratio of educational supply to openings

From an occupational supply perspective, valid and reliable follow-up data on vocational program graduates is essential. OOICC and OPPS recommend that an automated follow-up system combining community college student master files and SERVE records with the Unemployment Insurance Wage Records be instituted. This follow-up system would provide industry of employment and wages paid by program of training. This approach would protect student confidentiality.

APPENDICES

CLUSTER REVIEW ADVISORY COMMITTEE

Ron Munkres
Washington County ESD
17705 NW Springville Road
Portland, OR 97229

Ada Fancher
Corvallis Public Schools
1555 SW 35th
Corvallis, OR 97333

Jan Welle, Superintendent
Harrisburg Union High School District
400 S 9th Street
Harrisburg, OR 97446

Ellsworth Mayer
Blue Mountain Community College
2410 NW Carden Avenue
PO Box 100
Pendleton, OR 97801

Al Tekorius, Deputy Director
Apprenticeship & Training Division
Bureau of Labor & Industries
State Office Building
1400 SW 5th Avenue
Portland, OR 97201

Jean Duffett
Lane County Employment & Training
1140 Willagillespie, #44
Eugene, OR 97401

George Warren
Clackamas Community College
19600 S Molalla Avenue
Oregon City, OR 97045

Paul Erickson
Vocational Village
5040 SE Milwaukie Avenue
Portland, OR 97202

Joan Stoddard
Dept. of Education
700 Pringle Parkway SE
Salem, OR 97310

Hartley Troftgruben
Springfield School District
525 Mill Street
Springfield, OR 97477

Al Miller
Hillsboro Union High District
645 NE Lincoln Street
Hillsboro, OR 97123

Lowell Chamberlin
Coos County ESD
1350 Teakwood Ave.
Coos Bay, OR 97420

CLUSTER REVIEW BIBLIOGRAPHY

Bell, Terrel H. "Vocational Education and the Education Reform Movement." VocEd, The Journal of the American Vocational Association, October 1984.

Botterbusch, Karl F. A Manual of DOT Related Codes. Materials Development Center, University of Wisconsin-Stout, n.d.

Bottoms, Gene. "Now Is the Moment of Opportunity." VocEd, The Journal of the American Vocational Association, October 1984.

Brown, Kay. "The Vocational Approach to Math and Science." VocEd, The Journal of the American Vocational Association, October 1984.

Copa, George H. "Insights from the Past." VocEd, The Journal of the American Vocational Association, October 1984.

Educational Equity Project. "Academic Preparation for the World of Work," The College Board, 1984.

Fifth Annual Teaching Issue. VocEd, The Journal of the American Vocational Association, August 1984.

Flynn, Patricia M. "Training Cycles in Occupational Preparation." VocEd, The Journal of the American Vocational Association, October 1984.

Frugoli, Pamela. A Guide to Using the National Units of Analysis. National Occupational Information Coordinating Committee, August 1984.

Hamilton, Stephen F. Apprenticeship as a Transition to Adulthood in West Germany. Paper presented at the 1985 meeting of the American Educational Research Association, Chicago, Illinois.

Harrington, Thomas F. and Arthur J. O'Shea, eds. Guide for Occupational Exploration. American Guidance Service, 1984 (Second Edition).

Kunzman, Leonard. Occupational Career Clusters, The Oregon Way. Oregon Department of Education, 1975.

McKinlay, Bruce. The Functional Classification System. Career Information System, n.d.

National Academies of Science/Engineering. "The Core Competencies." News Report, vol. XXXIV, no. 6, June 1984.

The National Commission on Secondary Vocational Education. The Unfinished Agenda. National Center for Research in Vocational Education, 1984.

"National Units of Analysis." National Occupational Information Coordinating Committee, 1984.

Occupational Program Planning System. "Occupational Classification Crosswalk with Data Display." (Selected computer sorts) 1984.

Occupational Program Planning System. "Occupations by Industry." 1982.

Office of Management and Budget. Standard Industrial Classification Manual. U.S. Government Printing Office, 1972.

"Program Directions for Occupational Education in New York State." The State Education Department, Albany, New York, September 1984.

Rosenfeld, Stuart A. "Vocational Agriculture: A Model for Education Reform." Education Week, September 26, 1984.

Seckendorf, Robert S. "Rethinking the Purposes of Voc. Ed." VocEd, The Journal of the American Vocational Association, October 1984.

Solorzano, Lucia. "Vocational Education Gets Back to Basics." U.S. News & World Report, July 23, 1984.

U.S. Department of Commerce. Standard Occupational Classification Manual, U.S. Government Printing Office, 1980.

U.S. Department of Labor, Bureau of Labor Statistics. Occupational Outlook Handbook, 1984-85 Edition. U.S. Government Printing Office, April 1984.

U.S. Department of Labor, Bureau of Labor Statistics. Occupational Projections and Training Data. U.S. Government Printing Office, May 1984.

U.S. Department of Labor, Employment and Training Administration. Dictionary of Occupational Titles. U.S. Government Printing Office, 1977

U.S. Department of Labor, Employment and Training Administration. A Guide to Job Analysis. Materials Development Center, University of Wisconsin-Stout, March 1982.

U.S. Department of Labor, Employment and Training Administration. Manual for the USES General Aptitude Test Battery. Section II: Occupational Aptitude Pattern Structure. U.S. Government Printing Office, 1979.